Therapy & Rehabilitation
For training with a Body-Powered prosthesis

Information for O&P professionals and therapists
Tips for a successful training

This workout booklet provides a summary of knowledge, successful exercises and helpful tips for how to easily and reliably operate a Body-Powered prosthesis in everyday life. The exercises and recommendations are based on many years of experience with Otto Bock Body-Powered prostheses.

Structure
The sequence of these exercises was developed to support the structure of the training with a Body-Powered prosthesis. You will find several exercises for each training phase that can be performed according to the user’s current needs.

Awareness
To control a Body-Powered prosthesis, movements of the shoulders and trunk are required. Nevertheless be aware of posture when observing the following exercises to avoid/reduce compensatory movements. This increases the training success from the beginning and preserves the user from overuse:

1 Refers to the training brochure “The Michelangelo Hand in Practice”
General Tips & Training Recommendations

- Upright posture
- Balanced weight distribution
- No trunk rotation
- Equal shoulder position

EXPLAIN, SHOW, SUPPORT, EVALUATE

10–15 REPETITIONS PER EXERCISE

ADAPT TO THE USER’S SKILLS

GIVE EASY INSTRUCTIONS & MAKE BREAKS

VARY EXERCISES AND POSITION
Evaluation
For Body-Powered Fittings

Assessing the patient before starting with training is essential in a Body-Powered fitting. Those findings can influence the training procedure or fitting process.

Please focus especially on:

- Pressure pain
- Body awareness
- Limitations of ROM
- Muscle strengths and endurance
- Neuroma

On page 16 you will find a prepared 'Evaluation Sheet' you can also use for the assessment.
Physical training
Preparation for fitting

Improved physical conditioning is necessary when wearing an external weight like a prosthesis. Enhanced control and performance of the prosthesis will come with better balance, endurance, strength and muscle coordination.

10–15 REPETITIONS PER EXERCISE

The goal is to improve range of motion and strengthen the muscles and core. These exercises are also easy to perform at home.

- Before prosthetic fitting
- During rehabilitation

On page 17 you will find a prepared therapy sheet (Therapy 1/3: How to prepare for the fitting?) you can also use for the physical training.
1. Set up straight, feet shoulder-width apart. Move both arms symmetrically and slowly. Your eyes follow your hands. Make sure to tighten your abdominal muscles during the whole exercise.

2. Lie down with your back on the floor. Now lift the pelvis slowly from the ground and lower it again (not completely down). When lifting the hip breathe out and tighten the abdominal muscles. Both feet are on the same level. The further your feet are apart from the body, the harder the execution.

3. Lie down with your back on the floor, bend your knees, feet contact the ground and arms next to the body. Tighten abdominal muscles and lift head, arms and upper torso off the ground. Hold this position for a few seconds, and then slowly return to the starting position.

4. Set up straight, feet shoulder width apart, knees slightly bent. Push simultaneously an arm down – the other upwards and stretch slowly. Make sure that both shoulders are not raised. Next switch sides.

Please do about 12 repetitions per exercise.
1 Controls Training
Prosthetic training without objects

- The training makes the user more intimately familiar with handling the prosthesis.
- The user gets a feeling for how to operate the prosthesis without objects.
- This includes passive (manual features) and active functions (control of prosthesis).

GIVE EASY INSTRUCTIONS & MAKE BREAKS

Passive prosthesis functions

- Donning/doffing
- Connect/disconnect hand or hook
- Manual wrist rotator

On page 18 you will find a prepared therapy sheet (Therapy 2/3: Rehabilitation) you can also use for learning and improving the control of the prosthesis.
Open and close the hand/hook fully. As a next step, open and close the hand only half way.

Active prosthesis functions

The focus in this phase is the optimal use of the prosthesis and the harness system is checked for any readjustments.

Note: Voluntary opening requires muscle activity to keep the hand open. Voluntary closing requires muscle activity when closing the hand.

The goal is to achieve an opening and closing of the prosthesis with adequate muscle power. If this is not achieved ideally, the cabling or positioning of the harness system should be adapted.

The prosthetic control should be checked in the following arm positions:

- in front of the body with flexed elbow
- in front of the body with extended elbow
- over head
- across the body

Move on when the user feels secure in controlling the hand independently.
2 Repetitive Drills
Prosthetic training with objects

• This training phase focuses on training with objects (based on experience and scientific findings)
• Grasping, holding and releasing objects of various sizes, surfaces, hardesses and flexibilities
• Many variations, repetitions and combinations of exercises are integrated in the training

VARY EXERCISES AND POSITION

Goal
In any situations being able to reliably and confidently handle objects using appropriate control.

On page 18 you will find a prepared therapy sheet (Therapy 2/3: Rehabilitation) you can also use for learning and improving the control of the prosthesis.
A. Indirect grasping
Initially, the object is passed from the sound side to the prosthetic hand. The proprioceptive information received will support the user in operating the hand properly.

**Recommended training objects**
- Building blocks
- Soft balls
- Plastic cups
- Bottles
- Clothespins
- Plates/Bowls
- Cards

B. Direct grasping
Directly grasping an object with the prosthetic hand only:
- Grasp and release from different heights
- Improve movements and coordination

**Tip:** When picking up soft or flexible objects, try to vary the grip strength according to the texture of the object. Focus on the object at the same time as the movement is happening.

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² Hanneke Bouwsema, Learning to handle a myoelectric upper-limb prosthesis, 2014
3 ADL Training
Activities of Daily Living

To transfer the training to the daily routine, everyday tasks are integrated in the training.

**Goal**
To increase independence, carry out functional activities **confidently with both hands** using objects which are regularly used in daily life. Encourage prosthetic use and manage individual tasks.

On page 18 you will find a prepared therapy sheet (Therapy 2/3: Rehabilitation) you can also use for learning and improving the control of the prosthesis.
Example: Grab a towel with both hands and fold it twice. Make sure that both hands work together.

Activities of daily living:

Clothes/dressing
- Opening and closing zipper/buttons
- Tying one’s shoes
- Packing a bag
- Putting on a watch

Eating/drinking
- Eating with cutlery
- Pouring a drink
- Wiping the table
- Carrying a tablet
- Opening a banana
- Unsrew a container

Work/office
- Using a computer
- Using a ruler, scissors, pencil, sharpener, rubber
- Phone/mobile
- Writing with the prosthesis/holding piece of paper down

Hygiene
- Unscrewing tube of toothpaste
- Putting toothpaste on toothbrush
- Opening a cream container
- Washing hands
- Using the toilet

Others
- Folding laundry
- Hand brush and dustpan
- Opening purse/wallet and paying
- Opening and holding an umbrella

Train under realistic conditions and include individual hobbies and interests.
Training phases at a glance

- **Physical Training**
  - With/without prosthesis
  - Achieve optimal physical condition

- **1 Controls Training**
  - Gain general control of the prosthesis

- **2 Repetitive Drills**
  - Repeat exercises to master your prosthesis

- **3 ADL Training**
  - Use the prosthesis to its best advantage for everyday activities
Summary for successful Body-Powered prosthetic training

Goals
Gain more independence, increase self-awareness, prevent the symptoms of overuse.

Structure
Follow the phases of successful training and increase the level of difficulty step-by-step.

Encouragement
Chose exercises depending on individual interests and skills.

Variation
Do exercises both statically and dynamically with various objects and in different positions.

Empathy
Create a feeling of what can be expected from the user.

Coordination
Improve muscle power and endurance for better control.

Repetition
Repetitive activities provide stability and bring better experience.

Feedback
Visual and audible feedback plus body awareness assist when practicing.

Concentration
Be focused when practicing and make breaks for recuperation.

On page 19 you will find a prepared form (Therapy 3/3: Functional quality check) you can use for monitoring the learning progress of the user.
Evaluation Sheet
For Body-Powered Fittings (Upper Limb Prosthetics)

<table>
<thead>
<tr>
<th>Name of patient</th>
<th>ID</th>
</tr>
</thead>
</table>

Amputation level
- [ ] WD
- [ ] TR
- [ ] ED
- [ ] TH

Relevant professional/leisure activities

- Generalised pain at the residual limb
  - Area

- Neuroma
  - Area

Residual limb end load capacity
- [ ] contact tolerated
- [ ] no contact tolerated
- [ ] capable of bearing load
- [ ] not capable of bearing load

Sensitivity abnormalities?

Scars: healed? Movable?

Range of motion of both shoulders and elbows:

![Range of motion diagrams](image)

**Exclusion criteria for a Body-Powered fitting:**

- [ ] Shoulder disarticulation
- [ ] Painful neuroma
- [ ] Contracture or limited range of motion of the elbow or shoulder girdle (range)

For limitations of the range of motion and/or muscle status, see the “Therapy” worksheet
Therapy 1/3: How to prepare for the fitting?

Goal: improve range of motion and strengthen the core

1. Set up straight, feet shoulder width apart, knees slightly bent. Push simultaneously an arm down – the other arm upwards and stretch slowly. Make sure you hold both shoulders down. Your eyes follow your hands. Make sure to tighten your abdominal muscles during the whole exercise.

2. Lie down with your back on the floor. Now lift the pelvis slowly from the ground and lower it again to the floor. Tighten your abdominal muscles and lift the head, arms and upper torso off the ground. Keep contact the ground and arms next to the body. Breathe in when lifting and breathe out when lowering the pelvis. When lifting the hip breathe out and lighten the body contact the ground and lower it again to the floor. Make sure you keep your abdominal muscles during the whole exercise.

3. Lie down with your back on the floor. Now lift the pelvis slowly from the ground. Breathe in when lifting and breathe out when lowering the pelvis. Keep contact the ground and arms next to the body. Breathe in when lifting and breathe out when lowering the pelvis. Make sure you keep your abdominal muscles during the whole exercise.

4. Set up straight, feet shoulder width apart, knees slightly bent. Push simultaneously an arm down – the other arm upwards and stretch slowly. Make sure you hold both shoulders down. Your eyes follow your hands. Make sure to tighten your abdominal muscles during the whole exercise.

Please do about 12 repetitions per exercise.
Therapy 2/3: Rehabilitation
Goal: control the prosthesis CT/RD/ADL

Please do about 12 repetitions per exercise.

1. Open and close the hand alternately. As next step open and close the hand, but only half.

2. Grasp a solid object (e.g. wooden block) with the non-affected hand and pass it into the prosthetic hand. Pass the object alternately back and forth.

3. Now, pick up a soft, flexible object (e.g. foam ball, plastic cups) analogous to Exercise 2. The eyes are watching the object respectively the movement execution. Try to dose the grip strength according to the texture of the object.

4. Grab a towel with both hands and fold it twice. Make sure that both hands work together.
Therapy 3/3: Functional Quality Check

Goal: Assess prosthetic control via stereotypic exercises

1. Put the blocks on the table in front of you (on the prosthetic side). In the middle place a Book as an obstacle. Now try to give as many blocks as possible from the start of the exercise to completion. Try to improve from exercise to exercise.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
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<tbody>
<tr>
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Note: Pay attention to the same starting position in order to document the course of the exercises.

2. Position 6 plastic cups at the table. Stack these as a pyramid. In the middle place a Book as an obstacle. Now try to give as many blocks as possible from that side to the other side of the book within 30 seconds.

<table>
<thead>
<tr>
<th>Date</th>
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Note: Pay attention to the same starting position in order to document the course of the exercises.

Materials:
- Building blocks
- 6 plastic cups
- Book
- Stopwatch

For documentation, you can use the table below.

Name of the user: 
Type of fitting: 

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